

REMARKS

This Preliminary Amendment cancels, without prejudice, claims 1 to 13 in the underlying PCT Application No. PCT/EP2004/013280 and adds new claims 14 to 27. The new claims, inter alia, conform the claims to United States Patent and Trademark Office rules and does not add any new matter to the application.

In accordance with 37 C.F.R. § 1.125(b), the Substitute Specification (including the Abstract) contains no new matter. The amendments reflected in the Substitute Specification (including Abstract) are to conform the Specification and Abstract to United States Patent and Trademark Office rules or to correct informalities. As required by 37 C.F.R. §§ 1.121(b)(3)(ii) and 1.125(c), a Marked-Up Version of the Substitute Specification comparing the Specification of record and the Substitute Specification also accompanies this Preliminary Amendment. Approval and entry of the Substitute Specification (including Abstract) are respectfully requested.

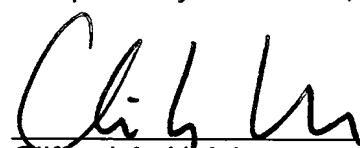
The underlying PCT Application No. PCT/EP2004/013280 includes an International Search Report, dated February 28, 2005, a copy of which is included. The Search Report includes a list of documents that were considered by the Examiner in the underlying PCT application.

It is respectfully submitted that the subject matter of the present application is new, non-obvious and useful. Prompt consideration and allowance of the application are respectfully requested.

Respectfully submitted,

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SYSTEM

FIELD OF THE INVENTION

The present invention relates to a system.

BACKGROUND INFORMATION

5 In industrial systems, it is known conventional that drive units can be powered from a network. For this purpose, drive units are mostly connected via expensive plug-and-socket connectors. In addition, the system or machine has a T-piece for each drive unit as an energy branch. These T-pieces are
 10 difficult to install and expensive, in particular when they must be usable and provide a high degree of protection in wet areas or even aseptic areas.

SUMMARY

15 Therefore, the object Example embodiments of the present invention is to may provide simpler and more cost-effective wiring in drive units and systems.

~~The object of the present invention is achieved by the system having the features indicated in Claim 1.~~

In the case of the system, the essential features of example embodiments of the present invention are include that it includes drive units, which are powered on a movable part, in particular e.g., a turntable or linear drive, in a contact-free manner, using, in each instance, an inductive coupling to one or more primary conductors. In this context, it is advantageous may be provided that the wiring may be implemented simply and rapidly and, in addition, in a well-arranged manner. Moreover, the system may be used in wet areas and in aseptic areas, since the inductive coupling allows the

housing to be manufactured to be smooth. Furthermore, power is transmitted in an erosion-free manner.

It is may also advantageous be provided that the power supply to the drive units is voltageless, and that the carrying-over of voltage otherwise present in systems, as well as spark-suppression devices in disconnecting switches, may be eliminated. In addition, reactive-power compensation is made possible, in particular e.g., in the drive unit, and therefore the alternating current has smaller values, which is why smaller wire diameters may also be provided in the case of primary conductors, and lower wiring costs are therefore attainable. Disconnecting switches may be eliminated, since interruption may be replaced by extraction of the primary conductor.

~~In one advantageous refinement, the The part is may be rotationally mounted or linearly movable. In this context, it is advantageous may be provided that the system may be manufactured as a turntable or a linear drive.~~

~~In one advantageous refinement, the The primary conductor powers may power the drive units in series. The advantage of this is This may provide that T-pieces are not necessary, and that highly cost-effective wiring is implementable, in particular e.g., without plug-and-socket connectors and the like, etc.~~

~~One advantageous embodiment provides Example embodiments may provide for the primary conductor to be supplied with energy in a contactless manner via stationary coil cores containing including at least one coil winding, or to be supplied with energy via a loop wire. An advantage aspect of the contactless transmission is that the movable part may be used, in turn, in wet areas or aseptic areas, and that no erosion occurs.~~

In one advantageous refinement, the The primary conductor is laid may be arranged as a closed loop. In this context, it is advantageous may be provided that it is particularly cost-effective, and that no starting pieces or end pieces are necessary.

In one advantageous refinement, at At least one drive unit includes may include an electric motor and an electronic circuit for powering the electric motor, the drive unit being able to be powered inductively. In this context, it is advantageous may be provided that the drive unit may be manufactured in a cost-effective manner to be impervious and to provide a high degree of protection, for the contactless powering of the drive unit allows may allow the housing to be manufactured simply and easily, in particular e.g., without uneven areas or plug-and-socket connectors, and therefore allows may allow water to drain off and the settling of solids to be prevented. Therefore, it is may be particularly usable in wet areas and aseptic areas. The present invention allows the time necessary for wiring to may be reduced.

In one advantageous refinement, a A primary conductor is may be provided on the drive unit in such a manner, that an inductive coupling to a secondary winding contained by the drive unit is providable. In this context, it is advantageous may be provided that a plug-and-socket connector is not necessary, and that the wiring may therefore be carried out in a simple and rapid manner. In addition, it is possible to reduce costs.

In one advantageous refinement, at At least one primary conductor is may be provided in a groove or a cable duct of the drive unit. In this context, it is advantageous may be provided that the cable may be laid arranged very simply and

rapidly, and that in addition, encapsulation with encapsulating material may be advantageously carried out.

5 ~~In one advantageous refinement, at~~ At least one secondary winding ~~is~~ may be wound around a U-shaped and/or E-shaped core. In this context, it ~~is~~ advantageous may be provided that the design may be selected as a function of the utilized method and desired efficiency.

10 ~~In one advantageous refinement, the~~ The primary conductors ~~are~~ may be at least partially encapsulated and/or protected by a cover. This ~~offers the advantage~~ may provide that a particularly high degree of protection is attainable.

15 ~~In one advantageous refinement, the~~ The drive unit ~~is~~ may be impervious, smooth on the outer surface, and/or manufactured to have a high degree of protection. In this context, it ~~is~~ advantageous ~~that~~ the drive unit may be provided, ~~in particular~~ e.g., for use in wet areas and/or aseptic areas.

20 ~~In one advantageous refinement, the~~ The drive unit ~~does~~ may not include a plug-and-socket connector or other electrical connection terminals on its exterior. In this context, it ~~is,~~ ~~in turn,~~ advantageous may be provided that the drive unit may 25 be easily manufactured to be impervious and to provide a high degree of protection.

~~Further advantages are yielded from the dependent claims.~~

List of Reference Numerals

LIST OF REFERENCE CHARACTERS

- 1 housing
- 2 rotor shaft
- 5 3 housing part
- 4 primary conductor
- 5 primary conductor
- 6 indentation
- 7 core having a U-shaped cross-section
- 10 21 primary conductor
- 22 primary conductor
- 23 clip
- 24 groove
- 25 groove
- 15 26 housing part
- 27 core having a U-shaped cross-section
- 28 second core having a U-shaped cross-section
- 31 cover
- 32 primary conductor
- 20 33 primary conductor
- 34 cable duct
- 35 core having an E-shaped profile
- 36 core having an E-shaped profile
- 37 printed circuit board
- 25 41 turntable
- 42 turntable drive
- 43 primary conductor
- 44 drive unit
- 45 stationary coil cores

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The Example embodiments of the present invention will now be
are explained in more detail below with reference to figures.
the appended Figures.

5 BRIEF DESCRIPTION OF THE DRAWINGS

Figures 1a to 1c illustrate a drive unit according to an
example embodiment of the present invention.

10 Figures 2a to 2c illustrate a drive unit according to an
example embodiment of the present invention.

Figures 3a to 3h illustrate a drive unit according to an
example embodiment of the present invention.

15 Figure 4 illustrates an example embodiment of the present
invention.

Figures 5a to 5g illustrate an example embodiment of the
present invention.

20
DETAILED DESCRIPTION
An isometric view, a sectional view, and a plan view of the a drive unit according to an example embodiment of the present invention are shown illustrated in Figures 1a, 1b, and 1c. The 25 drive unit includes an electric motor having a rotor shaft 2, which is surrounded by a housing 1. The electronic circuit for powering and controlling the electric motor is substantially protected by housing part 3, which has an indentation 6 in which a primary conductor is secured, using a winding loop. The return line, i.e., the second primary conductor, is only lead through, i.e., not wrapped around the drive unit.

30
Housing part 3 contains includes a core 7 having a U-shaped cross-section, around which a secondary winding is laid 35 arranged that powers the electronic circuit. Therefore, the

drive unit may be powered by the inductive coupling in a contactless manner, and is therefore galvanically separated from the primary circuit. The power supply of the drive unit may be disconnected rapidly and easily by unwinding or taking 5 down the loop of the primary conductor.

The primary circuit is powered by a device, which exhibits a current-source behavior with respect to the primary current generated by it.

10

In further exemplary embodiments of the present invention, information is transmitted by modulating higher-frequency signals onto the primary conductor, as the electronic circuit includes means device(s) for demodulating the signals. To 15 exchange information, the electronic circuit also includes means of modulation device(s), which means that signals may also be modulated onto the primary conductor.

In this manner, the drive unit may be powered in a contactless 20 manner. The consequence of this is that a novel powering principle may be realized in industrial systems and/or machines, ~~for in which~~ during the installation of the drive units, these must no longer need be electrically connected and wired with the aid of expensive plug-and-socket connectors, 25 but rather it is sufficient for a primary conductor to be wrapped around in the indentation of the drive unit.

In addition, a high degree of protection ~~is~~ may be realizable, since plug-and-socket connectors are eliminated and the drive 30 unit may therefore be inexpensively manufactured, along with its housing, so as to be impervious. Therefore, the drive unit may be manufactured to have, ~~in particular~~ e.g., a smooth housing and is consequently usable in aseptic applications or wet applications.

35

Means Device(s) for potential segregation and other separating devices may be eliminated, since the wall thickness of the housing may be appropriately dimensioned and the inductive coupling may be easily disconnected.

5
~~Of course, the~~ The electronic circuit also includes the secondary-side means device(s) for transmitting power inductively, i.e., without contact. ~~In an advantageous variant, these means are advantageously~~ These devices may
10 include passive components, i.e., capacitors and windings about coil cores. In ~~the simplest embodiment~~ a simple arrangement, the transformer head is wrapped with a winding in the form of a secondary winding, and a capacitor, whose capacitance is in resonance with the inductance of the
15 winding, is connected in outgoing circuit, the resonance frequency corresponding to the frequency of the alternating current in the primary conductor or deviating from it by not more than, e.g., 10%.

20 The drive units may be powered in series by the primary conductor. It is possible to decouple individual motors without having to interrupt the power supply of the others. It ~~is~~ may only be necessary to remove the primary-conductor loop around the drive unit, e.g., by lifting the conductor loop out
25 of the indentation.

The wiring ~~of the present invention eliminates~~ hereof may eliminate the need for T-pieces.

30 The drive unit is ~~drawn~~ illustrated as a rotary drive in Figures 1a, 1b, and 1c. ~~In other exemplary embodiments of the present invention, the~~ The drive unit is may be implemented as a linear drive and is may be inductively powered.

~~In further exemplary embodiments of the present invention for drive units, according to As illustrated in Figures 2a, 2b, and 2c, cores 27, 28 having a U-shaped cross-section are may be located on the B-side with grooves for primary conductors 21 and 22. A clip 23 is used for fixing the primary conductors in position in their grooves. Only one core 27 is may be necessary for functioning. Additional core 28 increases the efficiency of the entire device. The secondary windings on the two cores 27, 28 are interconnected and power the electronic circuit, which is, in turn, situated in the region of housing cover 26 that is provided on the B-side of housing 1.~~

~~In further exemplary embodiments of the present invention for drive units, according to As illustrated in Figures 3a, 3b, 3c, 3d, 3e, 3f, 3g, and 3h, which shew illustrate different views, some that mask material components as in Figure 3b, first primary conductor 32 is run arranged in a cable duct 34, which is provided in a semi-loop pointing upwards upwardly. Second primary conductor 33 is run arranged in a corresponding semi-loop pointing downwards downwardly. For purposes of inductive coupling, an E-shaped core 36 is provided in the upper semi-loop, and a second E-shaped core 35 is provided in the lower semi-loop, in particular e.g., in the material of the cover. The legs of the E of the E-shaped cores are brought forward to housing part 37. Housing part 37 protects a printed circuit board that carries windings, which run extend in the shape of a spiral, are produced as conductor tracks, and are provided as secondary windings. In particular For example, a flat, E-shaped core is placed on this printed circuit board and oriented in such a manner, that its legs meet the legs of E-shaped core 36 when extended. Therefore, a highly effective, inductive coupling is attainable, as indicated in Figure 3i. The printed circuit board may also be fitted with additional electronic components.~~

The function of cover 31 shown illustrated in Figure 3a is to provide mechanical protection, and to be a clamping device, i.e., strain-relief device. In Figure 3b, the material of cover 31 is omitted, so that E-shaped cores 35, 36 are 5 visible, as well as cable ducts 34. The cover may be detachably screwed to housing 1.

~~In further exemplary embodiments of the present invention, this The cover includes may include magnetically conductive 10 material for improved energy coupling. In particular For example, this material is may also advantageously be formed in the shape of a U or E.~~

~~In further exemplary embodiments of the present invention, 15 primary Primary conductors 32, 33 in the cable ducts are may be provided with encapsulating material for fixing them in position and sealing them.~~

~~Shown Illustrated in 5a, 5b, 5c, 5d, 5e, 5f, and 5g are 20 different views of an industrial system of an example embodiment of the present invention, which includes may include drive units of the present invention as described above.~~

25 In this context, a turntable 41 driven by turntable drive 42 is rotatable relative to stationary coil cores 45, which carry a coil for generating a medium-frequency, alternating field. The primary conductor passes through stationary coil core 45 and is therefore inductively coupled to the coil. In this 30 manner, power may be transmitted in a contactless manner from the coil to primary conductor 43, which leads, in turn, to drives 44 and likewise powers them in a contactless manner. A considerable advantage is This may provide that in wet applications or aseptic applications, or in the food- 35 processing and luxury-food industries, the system may

therefore be manufactured to provide a particularly high degree of protection and to be easily cleanable. In addition, the primary conductor may be installed simply and rapidly, and the manufacturing costs and maintenance costs of the entire 5 system are may therefore be reducible.

~~In particular, the The primary conductor is laid may be arranged in a closed path and is may be wound around each drive unit once.~~

10 A corresponding, further exemplary embodiment of the present invention is shown illustrated in Figure 4.

15 In further exemplary embodiments of the present invention, the primary conductor is wound several times around a drive unit 44.

20 In other exemplary embodiments of the present invention, primary conductor 43 is powered by a loop line instead of in a contactless manner.

25 In As illustrated in Figures 4 and 5, the drive units are shown mounted on a turntable 41. However, other exemplary embodiments of the present invention also provide for the drive units to be positioned under the turn table or at other locations.

30 In other exemplary embodiments of the present invention, a linearly movable table, on which the drive units are positioned, is provided in place of the turntable. The coil cores are then positioned along the path of motion and power the primary conductor that is laid arranged in an essentially a substantially linear manner.

In other exemplary embodiments of the present invention according to, such as those illustrated in Figure 4 or Figure 5, at least one different drive unit of, such as that illustrated in Figure 2 or 3 is used in place of the drive units of illustrated in Figure 1.

The method for contact-free energy transmission and the corresponding components are advantageously may be implementable in advantageous specific embodiments according to the features described, for example, in documents DE German Published Patent Application No. 100 53 373, DE German Published Patent Application No. 103 12 284, DE German Published Patent Application No. 103 12 792, DE German Published Patent Application No. 103 39 340, DE German Published Patent Application No. 103 38 852, DE German Published Patent Application No. 103 49 242, DE German Published Patent Application No. 103 44 144, DE German Published Patent Application No. 44 46 779, or also PCT International Published Patent Application No. WO 92/17929. In this context, it is particularly advantageous may be provided to use a medium frequency of approximately, e.g., 15 to 30 kHz. The adapter circuit following the transformer head, including the coil core, may be manufactured to be passive in a particularly advantageous manner, i.e. without electronic power semiconductors.

Abstract

ABSTRACT

A system, whereby drive units on a movable part, ~~in particular~~
e.g., a turntable or linear drive, are powered in a

5 contactless manner via, in each instance, an inductive
coupling to one or more primary conductors.